

## SECTION 16190

### SUPPORTING DEVICES

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Secure support for electrical items from the building structure by means of hangers, supports, anchors, concrete bases, sleeves, inserts, seals, and associated fastenings.

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**Edit 1.2 to match Project requirements. Delete 1.2 except where electrical supports are critical to the project.**

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##### 1.2 SUBMITTALS

- A. Submit the following in accordance with the provisions of Section 01300.
- B. Catalog Data: Submit catalog data for each type of product specified. Include information substantiating equivalent corrosion resistance to zinc coated steel of alternative treatment, finish, or inherent material characteristic.
- C. Material List: Submit hanger and support schedule showing manufacturer's figure number, size, spacing, features, and application for each required type of hanger, support, sleeve, seal, and fastener to be used.

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**Delete D except where fabricated supporting devices are required.**

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- D. Shop Drawings: Submit shop drawings showing details of fabricated products.

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**Delete E except where special supports with critical structural or seismic characteristics are required (i.e. safety class systems). List the items for which calculations are required.**

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- E. Calculations: Submit engineered design consisting of details and engineering analysis for supports for the following items:
  - 1. Seismic braced conduit supports for safety class systems.
  - 2. Seismic equipment anchorages for safety class equipment.

##### 1.3 QUALITY ASSURANCE

- A. Conform to the requirements of ANSI/NFPA 70—*National Electrical Code*.
- B. Where Underwriters Laboratories, Inc. has requirements for such products, furnish products listed and labeled by UL or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

#### PART 2 PRODUCTS

## 2.1 COATINGS

- A. Provide supports, hardware, and fasteners protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic.
- B. Provide products for use outdoors with hot-dip galvanized coating.

## 2.2 RACEWAY SUPPORTING DEVICES

- A. Provide supports as described below for the complete installation of raceway systems.
- B. Use pressed steel, single bolt hangers to support individual RGS, IMC or EMT conduit runs from threaded rods or beam clamps. Manufacturer: O-Z/Gedney "Type H-WBS".
- C. For individual runs of EMT up to 1 inch trade size, use coated spring steel conduit clips with positive snap closure. Manufacturer: ERICO CADDY "M Series".
- D. Use malleable iron conduit clamps to secure RGS, IMC or EMT conduit runs across, parallel, or perpendicular to beams, channels and angle supports. Manufacturer: O-Z/Gedney "Type UBC, UPC and UEC".
- E. Use two-piece carbon steel riser clamps for vertical conduits passing through floors. Manufacturer: Kindorf C-120.
- F. Use snap-on type one-hole steel straps to secure conduits up to 2 inch trade size to flat, dry interior surfaces. Manufacturer: O-Z/Gedney "Type 14S Series" for RGS and IMC and "Type 15S Series" for EMT.
- G. Use two-hole steel straps to secure conduits 2-1/2 to 4 inch trade size to flat, dry interior surfaces. Manufacturer: O-Z/Gedney "Type THR".
- H. Use one-hole malleable iron straps and clamp backs to secure conduits to flat exterior or damp flat interior surfaces. Manufacturer: Appleton "Type CL-M Series" with "Type CLB-M Series clamp backs".

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**Delete I except where the project includes vertical raceway risers with lengths exceeding those in Table 300-19(a) of ANSI/NFPA 70. Coordinate with Drawings.**  
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- I. Provide cable supports for vertical conduit. Use factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Furnish threaded body of malleable-iron casting with hot-dip galvanized finish. Manufacturer: O-Z/Gedney "Type R" or "Type S".

## 2.3 OUTLET BOX SUPPORTING DEVICES

- A. Provide pre-fabricated sheet steel brackets to support outlet boxes from metal studs in dry-wall construction.
- B. Provide brackets for single outlet boxes that are inset to allow for drywall ring and have a far side support leg. Manufacturer: ERICO CADDY "H Series".

- C. Provide brackets for multiple outlet boxes that are inset to allow for drywall rings and span from stud to stud. Manufacturer: ERICO CADDY "RBS Series".

## 2.4 FASTENERS

- A. Provide fasteners of the types, materials, and construction features as follows:
  - 1. Expansion Anchors: UL listed carbon steel wedge type studs. Manufacturer: Hilti "Kwik Bolt II".
  - 2. Toggle Bolts: All steel spring head type.
  - 3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
  - 4. Masonry Screw Anchors: Case hardened steel. Manufacturer: Hilti "Kwik-Con II".
  - 5. Beam Clamps: Malleable iron body with hardened set screw and threaded hole for threaded rod. Manufacturer: O-Z/Gedney "Type IS".
  - 6. Spring Tension Fasteners: Spring steel, designed specifically for the intended service. Manufacturer: ERICO "CADDY".

## 2.5 FRAMING CHANNEL SYSTEMS

- A. Provide U-channel framing systems using 12-gage steel channels, with 9/16-inch-diameter holes, from 1-1/2 to 1-7/8 inches on center, in the surface opposite the "U" opening.
- B. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer. Use two-piece, single bolt type conduit straps on U-channel supports.
- C. Manufacturers: Unistrut, B-Line, Superstrut.

## 2.6 FABRICATED SUPPORTING DEVICES

- A. Provide shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Provide steel brackets fabricated from angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

## 2.7 SLEEVES AND SEALS

- A. Provide pipe sleeves of one of the following:
  - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snap-lock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
    - a. 3-inch and smaller: 20-gage.
    - b. 4-inch to 6-inch: 16-gage.
    - c. over 6-inch: 14-gage.
  - 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe two pipe sizes larger than the penetrating raceway.

3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe two pipe sizes larger than the penetrating raceway.

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**Delete B except where watertight seals are required. Coordinate with Drawings and Section 16111.**

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- B. Provide factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, clamps, and cap screws. Manufacturer: O-Z/Gedney "Type FSK".

### PART 3 EXECUTION

#### 3.1 INSTALLATION - GENERAL

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with ANSI/NFPA 70 requirements and manufacturer's recommendations.
- B. Coordinate electrical supporting systems with the building structural system and with the work of other trades.
- C. Conform to manufacturer's recommendations for selection and installation of supports and fasteners.
- D. The strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
- E. Coat cut ends of shop or field fabricated supports with a rust-inhibiting finish compatible with the factory finish. Apply in accordance with manufacturer's instructions.
- F. Do not use wire or perforated strap for electrical supports.

#### 3.2 RACEWAY SUPPORTS.

- A. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
- B. Support three or more parallel runs of horizontal raceways together on trapeze hangers.
- C. Support individual horizontal raceways by separate pipe hangers. Do not support conduits from ceiling suspension wires.
- D. Space supports for raceways in accordance with ANSI/NFPA 70.
- E. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.

- F. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

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**Delete G except where the project includes vertical raceway risers with lengths exceeding those in Table 300-19(a) of ANSI/NFPA 70. Coordinate with Drawings.**

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- G. Install vertical cable supports simultaneously with installation of conductors.

### 3.3 BOXES AND CABINETS

- A. Support sheet metal boxes directly from the building structure or by approved brackets or bar hangers. Where bar hangers are used, attach the bar to structure on opposite sides of the box.
- B. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support
- C. Install surface-mounted cabinets and panelboards with minimum of four anchors. In wet or damp locations, provide steel channel supports to stand cabinet one inch off wall.
- D. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the specified structural safety factors. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

### 3.4 CONCRETE BASES

- A. Install floor mounted electrical equipment on 4 inch high reinforced concrete pads.

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**Edit B through E to match Project requirements; use B, C and G for concrete bases with a permanent steel perimeter, otherwise use D and E.**

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- B. Form concrete equipment bases with a permanent steel perimeter frame, using ASTM A 36 steel channels. Construct 4 inches larger in both directions than supported unit. Miter and weld corners and provide cross bracing. Anchor or key to floor slab.
- C. Install reinforcing bars tied to frame, and place anchor bolts, floor sills and sleeves using manufacturer's installation template.
- D. Form concrete equipment bases using framing lumber with form release compounds. Locate as indicated and construct 4 inches larger in both directions than supported unit. Chamfer top edges and corners.
- E. Install reinforcing bars, and place anchor bolts, floor sills and sleeves using manufacturer's installation template.
- F. Place concrete and allow to cure seven days before installation of equipment.
- G. Clean exposed steel frames and apply 2 coats of rust-preventative metal primer and 2 coats of exterior, gloss, alkyd enamel in color selected by the Architect.

### 3.5 HANGER RODS

A. Use threaded hanger rods not less than the sizes scheduled below:

1. Individually hung conduits, ½ inch through 1-1/4 inch ..... 1/4 inch
2. Individually hung conduits, 1-½ inch through 4 inch ..... 3/8 inch
3. Trapeze hung conduits, 10 foot maximum spacing..... 3/8 inch
4. Trapeze hung conduits, 20 foot maximum spacing..... 1/2 inch

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**Coordinate B with the Drawings. Delete if there is no suspended equipment.**

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B. Use hanger rods to support suspended equipment as indicated on the Drawings.

### 3.6 FASTENING

A. Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following schedule:

BUILDING MATERIAL	ELECTRICAL MATERIAL	FASTENER
Wood	Any	Wood screws.
Hollow masonry units	Any	Toggle bolts or masonry screw anchors.
Concrete or solid masonry	Any	Preset concrete inserts or expansion bolts.
Concrete or masonry	Cabinets, up to 2 inch conduit	Masonry screw anchors.
Concrete or masonry	Outlet boxes, 1/2 and 3/4 inch conduit	Threaded studs driven by a powder charge and provided with lock washers and nuts.
Structural steel	Any	Beam clamps, machine screws, or welded threaded studs.
Structural steel, non-corrosive, indoor locations	Outlet boxes, 1/2 and 3/4 inch EMT	Spring tension fasteners.
Sheet metal	Any	Sheet metal screws.
Metal studs	Outlet boxes, 1/2 and 3/4 inch EMT	Spring tension fasteners, sheet metal screws.
Acoustical ceiling T-bars	Outlet boxes, 1/2 & 3/4 inch EMT	Spring tension fasteners, sheet metal screws

B. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of

more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill unused holes.

- C. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.
- D. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- E. Install fasteners in accordance with manufacturer's instructions. Tighten fasteners to manufacturer's recommended torque.

### 3.7 SLEEVES AND SEALS

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#### **Edit A to match Project requirements.**

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- A. Install sleeves in concrete slabs and walls and all other fire- rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL- listed fire stopping sealant in gaps between sleeves and enclosed conduits and cables. Follow manufacturer's instructions to restore original fire rating of wall or slab.

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#### **Edit B to match Project requirements.**

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- B. Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- C. Request inspection of firestop installations by the LANL Authority Having Jurisdiction both before and after installation of firestop materials.

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#### **Delete 3.8 except for projects with critical requirements.**

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### 3.8 TESTS

- A. Test pull-out resistance of one of each type, size, and anchorage material for the following fastener types:
  - 1. Expansion anchors.
  - 2. Toggle bolts.
  - 3. Powder-driven threaded studs.
  - 4. Masonry screw anchors.
- B. Provide all jacks, jigs, fixtures, and calibrated indicating scales required for reliable testing. Obtain the structural Engineer's approval before transmitting loads to the structure. Test to 90 percent of rated proof load for fastener. If fastening fails test, revise all similar fastener installations and retest until satisfactory results are achieved.

END OF SECTION